Final

LONG-TERM GROUNDWATER MONITORING PLAN
St. George Island, Alaska

Pribilof Islands Environmental Restoration Project
St. George Island, Alaska

August 29, 2005

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ACRONYMS AND ABBREVIATIONS

AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
AST	Aboveground storage tank
Bgs	Below ground surface
CAP	Corrective action plan
CESI	Columbia Environmental Sciences Inc.
Chadux	St. George Chadux Corporation
DRO	Diesel range organics
EPA	U.S. Environmental Protection Agency
FY	Fiscal year
GRO	Gasoline range organics
LNAPL	Light nonaqueous-phase liquid
NOAA	National Oceanic and Atmospheric Administration
OPP	Old Power Plant
PCE	Perchloroethylene
PCS	Petroleum-contaminated soil
Polar	Polarconsult Alaska Inc.
SVOC	Semivolatile organic compound
SLR	SLR Alaska
SOP	Standard operating procedure
TAH	Total aromatic hydrocarbons
Tanaq	St. George Tanaq Corporation
TAqH	Total aqueous hydrocarbons
Tetra Tech	Tetra Tech EM Inc.
TPA	Two-party Agreement
UST	Underground storage tank
VOC	Volatile organic compound

EXECUTIVE SUMMARY

This long-term groundwater monitoring plan addresses 47 wells installed on St. George Island to gather information critical to environmental investigations and remediation planning pursuant to a Two Party Agreement (TPA) between National Oceanic and Atmospheric Administration (NOAA) and the State of Alaska Department of Environmental Conservation (ADEC). Groundwater studies utilizing these wells provide data on contaminant concentration, fate, and transport at island locations where past government operations contributed to the contamination of the site. In the future, a select number of these wells will be needed for gauging the long-term effectiveness of remedial actions, to monitor for contaminant plume migration, and for utilization during free-phase petroleum product (free product) removal activities. However, monitoring wells also pose a liability by providing a potential conduit for introducing contaminants to groundwater, and by impeding use of the land around them. Therefore, wells that are not needed by NOAA for long-term groundwater monitoring or free product removal will be decommissioned in accordance with applicable ADEC requirements.

Monitoring wells addressed by this plan are located in the vicinity of the City of St. George (the City). Twenty-five of the 47 wells will be retained, and 22 will be decommissioned. Ten of the retained wells will be used to monitor for the migration of free product plumes located in the industrial and waterfront areas of the City. The remaining 15 retained wells will be used, as needed, for free product removal or process water injection during remediation of the plumes; they may also be used for monitoring of contaminant trends once remedial efforts have been completed. As future remedial actions progress, NOAA may decommission a number of these retained wells if it is determined that they are not required for free product removal or long-term monitoring. Wells used for monitoring for free product plume migration (sentinel wells) will be sampled semiannually for five years beginning in Fiscal Year 2006 (subject to funding availability); thereafter NOAA will evaluate the data and submit a recommendation to ADEC for further sampling or closure. Water samples will be analyzed for contaminants known to be present in the City area groundwater aquifer. Table 2-1 summarizes plans for wells on St. George; Figures 2-1 and 2-2 provide well locations.

1.0 INTRODUCTION

The National Oceanic and Atmospheric Administration (NOAA) National Ocean Service, through its Office of Response and Restoration, Pribilof Project Office, is responsible for site characterization and restoration on St. George Island, Alaska. Public Law No. 104-91 of 1996 (Pribilof Environmental Restoration Act) and Public Law No. 106-562 of 2000 (Pribilof Transition Act) provide the mandate for these activities. The Two-party Agreement (TPA) signed on January 26, 1996, between NOAA and the Alaska Department of Environmental Conservation (ADEC) provides the framework for site restoration (NOAA 1996).

St. George Island is the second largest of the Pribilof Islands, a five-island archipelago in the Bering Sea (Figure 1-1). The other islands include St. Paul Island, which is the largest of the Pribilof Islands, Otter Island, Sea Lion Rock, and Walrus Island. The only inhabited islands are St. Paul and St. George.

This plan addresses 47 groundwater-monitoring wells located in the vicinity of the City of St. George (the City) that NOAA installed to evaluate the nature and extent of groundwater contamination at 13 TPA sites (Figure 1-2). These sites are:

- TPA Site 1 (Former Diesel Tank Farm)
- TPA Site 2 (Former Drum Storage Area)
- TPA Site 3 (Inactive Gas Station)
- TPA Site 6 (Open Pits Site)
- TPA Site 7 (Ballfield/Former Landfill)
- TPA Site 8 (Active Power Plant)
- TPA Site 9 (Old Power Plant)
- TPA Site 11 (Cottage C UST)
- TPA Site 18 (Former Fuel Storage Area)
- TPA Site 22-1 (School UST)
- TPA Site 22-3 (Shop/Store UST)
- TPA Site 23 (Abandoned Diesel Tank Farm)
- TPA Site 24 (Inactive Gas Tank Farm)

NOAA has completed soil remediation activities at all the above sites except TPA Site 1 and TPA Site 2 (Figure 1-3). NOAA conducted groundwater sampling in September/October 2001, October 2002, August 2003, November 2003, January 2004, and May 2004 at wells shown in Figures 2-1 and 2-2. Groundwater samples were analyzed for diesel range organics (DRO), gasoline range organics (GRO), volatile organics (VOC), semi-volatile organics (SVOC) and metals. NOAA anticipates excavating petroleum-contaminated soil (PCS) at TPA Sites 1 and 2 during the 2006 field season, subject to funding availability. In 2006, NOAA will also begin remediation of free-phase petroleum product plumes (free product), located in the vicinities of TPA Site 1 and TPA Site 8, subject to funding availability. Detailed information on island geology, hydrogeology, and groundwater sampling results for these sites can be found in Tetra Tech EM Inc.'s (Tetra Tech) *Final Field Investigation Report, Pribilof Islands Environmental Restoration Project, St. George Island, Alaska* (Tetra Tech 2005a).

2.0 LONG-TERM GROUNDWATER MONITORING PLANS

The following sections provide information on the background, remedial actions taken, groundwater monitoring results, planned well disposition and long-term groundwater monitoring plans for TPA sites addressed by this document. Table 2-1 summarizes long-term plans for each well within the sites; Table 2-2 provides a synopsis of sampling results for each well.

2.1 RETAIN MONITORING WELLS

NOAA installed 25 monitoring wells to investigate groundwater contamination at TPA Site 1 (Former Diesel Tank Farm), Site 2 (Former Drum Storage Area), Site 3 (Inactive Gas Station), Site 8 (Active Power Plant) and Site 22-1 (School UST). These wells are located both within, and encompassing, an area where free product has been detected during sampling events (Tetra Tech 2005a). Free product plumes are believed to be located in the vicinities of TPA Site 1 and TPA Site 8 (Tetra Tech 2004). Figures 2-1 and 2-2 show well locations and estimated plume extents. In 2004, St. George Chadux Corporation (Chadux), under contract to NOAA, hired environmental consulting firm SLR Alaska (SLR) to conduct free product removal testing, and determine the suitability of different recovery methods for remediation of the plumes (SLR 2005). Based on SLR's final recommendations (pending), and with ADEC concurrence, NOAA will choose a product removal system and begin plume remediation in 2006, subject to funding availability. NOAA will not know which currently installed wells will be needed for plume remediation until a final system design has been produced. However, based on four quarters of groundwater sampling (Tetra Tech 2005a), it is known which wells monitor areas that do not currently have free product on the water table, and therefore will make suitable sentinel wells for monitoring plume movement. The remaining wells will be retained until it is certain they cannot be utilized for plume remediation and/or used for long-term contaminant trend monitoring once remediation has been completed. The following discusses each TPA site where wells will be retained.

2.1.1 TPA Site 1 (Former Diesel Tank Farm) and TPA Site 2 (Former Drum Storage Area)

TPA Sites 1 and 2 were used from the 1950s to the 1970s for bulk storage of fuels. Transfer lines routed from the east boat launch and the west landing provided fuel to the Diesel Tank Farm (Figure 1-2); these lines have been designated TPA Site 25-1 (Port Fuel Supply Line E-W). Environmental investigations performed in 1994 by Woodward-Clyde, in 2001 by Columbia Environmental Sciences, Inc. (CESI), and in 2001 by Tetra Tech found widespread DRO and GRO contamination of soil at these sites (NOAA

2004a). Remediation of soil at these sites, estimated to require the removal of 11,180 cubic yards of PCS (NOAA 2004a), has not been conducted to-date.

In 2001, monitoring wells TPA1-MW-1 and TPA2-MW-1 were installed at TPA Sites 1 and 2. In 2003, monitoring wells TPA1-MW-2, TPA1-MW-3, TPA1-MW-4, TPA1-PER-1, TPA1-PER-2, TPA1-PER-3, and TPA2-MW-2 were installed (Figure 2-2). Groundwater sampling was conducted in 2001, 2002, August 2003, November 2003, January 2004 and May 2004; samples were analyzed for DRO, GRO, VOC, SVOC and metals with the following results (Tetra Tech 2005a):

- Free product was observed in wells TPA1-MW-1 and TPA1-MW-4;
- Dissolved-phase DRO and GRO above ADEC Table C criteria (ADEC 2003) was found in wells TPA1-MW-2, TPA1-MW-3, and TPA2-MW-1;
- Benzene above the Table C criterion was found in wells TPA1-MW-1 and TPA1-MW-3 for all sample events when benzene was an analyte;
- All analytes were below ADEC criteria in well TPA2-MW-2, with one exception being a benzene result slightly above the ADEC criterion in November 2003;
- Samples were not drawn from wells TPA1-PER-1, TPA1-PER-2, and TPA1-PER-3 because they were inadvertently installed in perched water tables not representative of the area's main groundwater aquifer.

2.1.2 TPA Site 8 (Active Power Plant)

TPA Site 8 was the location of two 4,000-gallon diesel fuel Underground Storage Tanks (USTs) that were installed (one in 1962, the other in early 1970s) to supply fuel to the current St. George Island electric power plant. In 1997, NOAA contractor St. George Tanaq Corporation (Tanaq) removed the tanks and approximately 1,128 cubic yards of DRO contaminated soil. System inspections during tank removal indicated that underground tank piping connections were made improperly, thereby leading to chronic leakage during tank filling operations (Polar 1997). Leakage from these tank systems is the probable source of the free product groundwater plume found in the TPA Site 8 area.

In 2001, NOAA installed monitoring wells TPA8-MW-1 through TPA8-MW-9; in 2003 monitoring wells TPA8-MW-10 through TPA8-MW-13 were installed (Figure 2-2). Groundwater sampling was conducted in 2001 and 2002 (for wells installed in 2001); and in August 2003, November 2003, January 2004 and May 2004; samples were analyzed for DRO, GRO, VOC, SVOC and metals with the following results (Tetra Tech 2005a):

- Free product was observed in wells TPA8-MW-1, TPA8-MW-3, TPA8-MW-5, TPA8-MW-7, TPA8-MW-8, TPA8-MW-10, and TPA8-MW-12;

- Dissolved-phase DRO above ADEC Table C criteria was found in wells TPA8-MW-2, TPA8-MW-4, TPA8-MW-6 (which was dry 4 out of 6 sampling events), and TPA8-MW-11;
- Perchloroethylene (PCE) above the Table C criterion was found in well TPA8-MW-2 in one sampling event (May 2004). The source of PCE is unknown;
- All analytes were below ADEC criteria in wells TPA8-MW-9 and TPA8-MW-13.

2.1.3 TPA Site 22-1 (School UST)

TPA Site 22-1 was the location of a 1,000-gallon diesel fuel UST that was installed in the 1960s when the St. George School was constructed. Use of the tank was discontinued in 1970s; and NOAA contractor Tanaq removed the tank in 1997. Tanaq's environmental consultant, Polarconsult Alaska, Inc. (Polar), reported approximately 10 cubic yards of DRO contaminated soil was excavated from the site. Observations made during tank removal indicate that spills resulting from overfilling the UST were the probable cause of the DRO soil contamination (Polar 1997).

In 2001, NOAA installed monitoring well TPA22.1-MW-1 (Figure 2-2). Groundwater sampling was conducted in September/October 2001, October 2002, August 2003, November 2003, January 2004 and May 2004. Sample analytical results indicated that all analytes (DRO, GRO, VOC, SVOC and metals) were below ADEC Table C criteria (Tetra Tech 2005a).

2.1.4 Non-TPA Related Wells

NOAA installed monitoring wells VIL-MW-1 in 2001 and VIL-MW-3 in 2003 (Figure 2-2) for use in a hydrogeological modeling network. Groundwater sampling was conducted in September/October 2001 (VIL-MW-1), October 2002 (VIL-MW-1), August 2003, November 2003, January 2004 and May 2004. Sample analytical results indicated that all analytes (DRO, GRO, VOC, SVOC and metals) were below ADEC Table C criteria (Tetra Tech 2005a).

2.1.5 St. George Monitoring Wells: Retention

Hydrogeological investigations (Tetra Tech 2005b) have shown that groundwater flow in the vicinities of the TPA Site 1 and Site 8 free product plumes is to the north immediately along the waterfront, and to the west and east when moving inland from the coastline (Figures 2-2 and 2-3). Wells to be used for monitoring free product plume movement (sentinel wells) must be located appropriately in regards to groundwater flow direction, and have a sampling history of no free product observed. With these criteria in mind, NOAA will retain the following ten wells as sentinel wells: TPA1-MW-2, TPA1-MW-3, TPA2-

MW-1, and TPA2-MW-2 for plume movement north; TPA8-MW-4, TPA8-MW-9, TPA22.1-MW-1 for plume movement to the east and southeast; TPA8-MW-13 and VIL-MW-3 for plume movement to the west; and VIL-MW-1 for plume movement to the south.

Sentinel wells will be sampled semiannually for five years; thereafter NOAA will evaluate the data and submit a recommendation to ADEC for further sampling or closure. Sample analytes will be the previously identified contaminants of concern, *i.e.* DRO, GRO, benzene and PCE. Sampling will be conducted in accordance with Section 3.0. Well monitoring will include inspection and photo documentation of well conditions, with expedient repairs or other actions performed when required. NOAA will report analytical results to ADEC semiannually beginning in Fiscal Year (FY) 2006 contingent on the availability of funds.

NOAA will retain the following 15 wells for possible future use in free product removal or process water injection during remediation of the plumes; or for long-term monitoring of contaminant trends once free product remedial actions have been completed: TPA1-MW-1, TPA1-MW-4, TPA1-PER-1, TPA1-PER-2, TPA1-PER-3, TPA8-MW-1, TPA8-MW-2, TPA8-MW-3, TPA8-MW-5, TPA8-MW-6, TPA8-MW-7, TPA8-MW-8, TPA8-MW-10, TPA8-MW-11 and TPA8-MW-12. Remediation of contaminated soil in TPA Sites 1 and 2, and free product removal from TPA Sites 1 and 8 are expected to commence in FY 2006, contingent on availability of funds. NOAA will be in a better position to determine long-term use of the non-sentinel wells once final product removal designs are available, and/or contaminated soil has been removed. NOAA will propose long-term monitoring plans for these wells once more is known of final site contamination levels and locations. If it is determined that any of the retained wells are not needed, they will be decommissioned after receiving concurrence from ADEC.

2.2 DECOMMISSION MONITORING WELLS

NOAA installed 22 monitoring wells to investigate groundwater contamination at the following locations: TPA Site 6 (Open Pits Site), TPA Site 7 (Ballfield/Former Landfill), TPA Site 9 (Old Power Plant), TPA Site 11 (Cottage C UST), TPA Site 18 (Former Fuel Storage Area), TPA Site 22-3 (Shop/Store UST), TPA Site 23 (Abandoned Diesel Tank Farm), and TPA Site 24 (Inactive Gas Tank Farm). Soil remediation actions have been completed at all of these sites. NOAA is in receipt of Conditional Closures from ADEC for all of these sites with the exception of TPA Site 7 (Conditional Closure Request pending) and TPA Site 11 which was de-listed as a TPA site in 2004 (ADEC 2004a). Analytical results from several quarters of sampling indicate that groundwater is not contaminated at these sites (Tetra Tech 2005a).

Monitoring wells pose a liability by providing a potential conduit for introducing contaminants to groundwater, and by impeding use of the land around them. Therefore, monitoring wells will be decommissioned at sites where remedial actions have been completed and groundwater is uncontaminated. The following discusses each TPA site where wells will be decommissioned.

2.2.1 TPA Site 6 (Open Pits Site)

TPA Site 6 is the location of a former quarry and covers an area of approximately 2 acres. The site was used for the disposal of solid waste, including domestic trash, coal, building materials, pipe, tires, scrap metal, concrete structures, drums, heavy equipment, and fuel storage tanks. An inventory and bulking operation to remove government-owned drums, propane cylinders, and batteries was conducted in 1993 by Woodward-Clyde. Hart Crowser conducted a site investigation, which included collection of soil samples in 1996. This investigation identified soil contamination at the two locations subsequently referred to as the Coal and Southeast Subsites. Tanaq conducted debris cleanup activities in 1997. During the debris removal activities, additional soil contamination was identified at the location subsequently referred to as the Crane Subsite. In 1997, Tanaq excavated 2,149 cubic yards of PCS from the three subsites. Excavation of soil was continued until contamination was removed, equipment refusal due to bedrock occurred, or an excavation depth of 15 feet below ground surface (bgs) was reached (Polar 2004a). In March 2004, NOAA received notice from ADEC that no further soil remediation action was necessary (ADEC 2004b).

In 2002, NOAA installed monitoring wells TPA6-MW-1 and TPA6-MW-2 (Figure 2-1). Groundwater sampling was conducted in October 2002, August 2003, November 2003, January 2004 and May 2004. Sample analytical results indicated that all analytes (DRO, GRO, VOC, SVOC and metals) were below ADEC Table C criteria (Tetra Tech 2005a).

2.2.2 TPA Site 7 (Ballfield/Former Landfill)

TPA Site 7 is the location of a former municipal landfill that was closed sometime prior to 1967, with the area over the landfill cover subsequently converted to recreational use. In August of 2003, ADEC approved a corrective action plan (CAP) that implemented a “limited source removal” at two locations where contaminant concentrations near the ground surface exceeded applicable ADEC cleanup levels. One location was contaminated with lead; the other location was contaminated with DRO. The CAP also called for ensuring that the former landfill footprint had a minimum of two feet of clean cover to prevent inadvertent exposure to materials that had been buried during landfill operations (NOAA 2005a).

In November of 2003, the two hot spots (lead and DRO) were excavated; five cubic yards of soil was removed from each location. Approximately 930 cubic yards of clean cover material was placed, contoured, and compacted over the entire landfill area to ensure proper runoff, and to provide a relatively flat area for continued recreational use (NOAA 2005a). Post-closure monitoring of the landfill cover will be performed in accordance with the monitoring plan submitted to ADEC as Appendix F of NOAA's TPA Site 7 corrective action report (NOAA 2005a).

In 2001, NOAA installed five monitoring wells TPA7-MW-1 through TPA7-MW-5 (Figure 2-1) to investigate contaminant migration from the landfill. Groundwater sampling was conducted in September/October 2001, October 2002, August 2003, November 2003, January 2004 and May 2004. Groundwater sample analytical results indicated that all analytes (DRO, GRO, VOC, SVOC and metals) were below ADEC Table C criteria. In May 2004, ephemeral pools located around the perimeter of the former landfill were sampled for dissolved lead, total aromatic hydrocarbons (TAH), and total aqueous hydrocarbons (TAqH) using surface water protocols. Analytical results indicated that the lead, TAqH and TAH all met surface water criteria (Tetra Tech 2005a).

2.2.3 TPA Site 9 (Old Power Plant)

TPA Site 9 was the location of an old power plant (OPP) that was constructed in 1936 to provide diesel-generated power to the City. The OPP was operated until approximately 1963. The OPP included 11 aboveground storage tanks (ASTs) used to store diesel fuel, gasoline, and lubricating oil as well as a wood-framed building that contained the generators. Reportedly, fuel was supplied to the ASTs from drums staged at the Former Fuel Storage Area (TPA Site 18), located south of the OPP. A pipeline was used to transport the fuel via gravity from the Former Fuel Storage Area to the ASTs (Tetra Tech 2005c).

In 2004, NOAA contractor Chadux removed approximately 1,230 cubic yards of PCS, and 17 cubic yards of lead-contaminated soils from excavations at the OPP. No PCBs were detected during investigation activities. Excavation depths varied from approximately 1 to 10 feet bgs, and were restricted because of refusal encountered due to the presence of shallow bedrock and large boulders; building foundation stability concerns; utilities in the area; and a cliff to the north of the site. All contaminated soil was removed where practicable (Tetra Tech 2005c). In June 2005, NOAA received notice from ADEC that no further soil remediation action was necessary (ADEC 2005).

In 2001, NOAA installed monitoring wells TPA9-MW-1A and TPA9-MW-1, however it was determined that well TPA9-MW-1A was screened in a perched water table not connected to the main groundwater aquifer. Therefore, in 2003 monitoring well TPA9-MW-2 was installed (Figure 2-1). Groundwater

sampling was conducted in September/October 2001 and October 2002 (TPA9-MW-1 and TPA9-MW-1A); and August 2003, November 2003, January 2004 and May 2004 (TPA9-MW-1 and TPA9-MW-2). Groundwater sample analytical results for TPA9-MW-1 and TPA9-MW-2 indicated that all analytes (DRO, GRO, VOC, SVOC and metals) were below ADEC Table C criteria. In 2001 and 2002, analytical results for TPA9-MW-1A indicated DRO above ADEC cleanup levels in the perched water zone (Tetra Tech 2005a).

2.2.4 TPA Site 11 (Cottage C UST)

TPA Site 11 was the location of a 1,000-gallon UST that was installed in the 1960s to supply federal housing unit Cottage C with diesel heating fuel. In 1997, NOAA contractor Tanaq removed the UST and 98 cubic yards of PCS. The UST was observed to have holes in it, which led to the soil contamination. The excavation extents were limited by concerns for the Cottage C foundation and equipment refusal caused by bedrock at the bottom of the excavation (Polar 1997).

In 2001, NOAA installed monitoring wells TPA11-MW-1 down gradient from Cottage C to investigate groundwater contamination (Figure 2-1). Groundwater sampling was conducted in September/October 2001, October 2002, August 2003, November 2003, January 2004 and May 2004. Sample analytical results indicated that all analytes (DRO, GRO, VOC, SVOC and metals) were below ADEC Table C criteria (Tetra Tech 2005a).

2.2.5 TPA Site 18 (Former Fuel Storage Area)

TPA Site 18 was the former storage location of fuel drums used to supply diesel fuel to the OPP (TPA Site 9). Fuel was piped through an aboveground, gravity feed system to ASTs located adjacent to the OPP. Site investigations, performed in 1996 and 2001, indicated widespread DRO soil contamination, and three distinct locations where mercury concentrations in the soil exceeded ADEC cleanup criteria (Polar 2004b).

In 2003, Chadux removed nine cubic yards of mercury-contaminated soil, and 2,426 cubic yards of PCS. Soil excavation was limited by equipment refusal due to bedrock, underground utilities, and the stability of nearby roads. All contaminated soil was removed as practicable (Polar 2004b). In April 2005, NOAA received concurrence from ADEC that no further soil remediation action was necessary (NOAA 2005b).

In 2001, NOAA installed monitoring wells TPA18-MW-1 and TPA18-MW-2 down gradient from TPA Site 18 to investigate groundwater contamination (Figure 2-1). Groundwater sampling was conducted in September/October 2001, October 2002, August 2003, November 2003, January 2004 and May 2004.

Sample analytical results indicated that all analytes (DRO, GRO, VOC, SVOC and metals) were below ADEC Table C criteria (Tetra Tech 2005a).

2.2.6 TPA Site 22-3 (Shop/Store UST)

TPA Site 22-3 was the location of a 1,000-gallon UST that stored diesel fuel for heating Tanaq's office building. Its installation date is thought to have been in the early 1960s when the Tanaq building was constructed, with discontinuation of use in the late 1970s (Polar 1997).

In 1997, as part of a multi-site environmental investigation, debris removal, and UST decommissioning effort, Tanaq, with Polarconsult Alaska, Inc. providing environmental consultation, removed the UST. Site assessment at the time of removal determined that the soil surrounding the UST was contaminated with DRO. Subsequently, approximately 402 cubic yards of contaminated soil was excavated from the site. The excavation started at the UST location and expanded horizontally until further excavation was not possible due to the risk of undermining building foundations, interference from nearby septic tanks, and concerns about excavating adjacent to a nearby cliff. The excavation expanded vertically until equipment refusal was reached due to an underlying basalt layer (Polar 1997). In 2004, NOAA received a "No Further Action Planned" determination from ADEC for TPA Site 22-3 (ADEC 2004c).

In 2001, NOAA installed monitoring wells TPA22.3-MW-1 near the UST excavation site (Figures 1-3 and 2-1). Groundwater sampling was conducted in September/October 2001, October 2002, August 2003, November 2003, January 2004 and May 2004. Sample analytical results indicated that all analytes (DRO, GRO, VOC, SVOC and metals) were below ADEC Table C criteria (Tetra Tech 2005a).

2.2.7 TPA Site 23 (Abandoned Diesel Tank Farm)

TPA Site 23 was the location of aboveground diesel fuel storage that consisted of thirteen 20,000-gallon tanks and one 2,500-gallon tank. Diesel fuel was transferred to and from the ASTs via aboveground and underground piping (Figure 1-3); the piping system was subsequently designated as TPA Site 25-2 (Port Fuel Supply Line N-S). The facility was reportedly constructed in the 1970s, and abandoned in 1993 after a fuel depot became operational at St. George Harbor (NOAA 2005c).

Site investigations performed in 1992 (Ecology & Environment, Inc.) and in 1995 (Hart Crowser) found DRO contamination in surface and subsurface soils. Soil contamination apparently resulted from leaking pipe connections and overfilling tanks during diesel fueling operations. In 1997, Tanaq removed the ASTs and excavated 4,150 cubic yards of PCS. In 2003, while excavating contaminated soil from TPA

Site 25-2, an additional 1,450 cubic yards of PCS was removed from TPA Site 23 (Figure 1-3). In 2005, NOAA received concurrence from ADEC for conditional closure of TPA Site 23 (NOAA 2005c).

In 2001, NOAA installed monitoring wells TPA23-MW-1, TPA23-MW-2 and TPA23-MW-3 up and down gradient of the TPA 23 excavation (Figures 1.3 and 2-1). Groundwater sampling was conducted in September/October 2001, October 2002, August 2003, November 2003, January 2004 and May 2004. Sample analytical results indicated that all analytes (DRO, GRO, VOC, SVOC and metals) were below ADEC Table C criteria (Tetra Tech 2005a).

2.2.8 TPA Site 24 (Inactive Gasoline Tank Farm)

The U.S. Fish and Wildlife Service constructed TPA Site 24 in the late 1960s. The facility first consisted of three 8,000-gallon ASTs and a pump house, and was later expanded (after transfer of ownership to the City) by the addition of two 15,000-gallon and two 1,100-gallon ASTs. Gasoline was transferred to and from the ASTs via an aboveground piping system later designated TPA Site 25-2 (Port Fuel Supply Line N-S). The facility was abandoned in 1993 after a fuel depot and gasoline station became operational at St. George Harbor.

Site investigations performed in 1992 (Ecology & Environment, Inc.) and in 1995 (Hart Crowser) found GRO and DRO contamination in surface and subsurface soils. Soil contamination apparently resulted from leaking pipe connections (diesel and gasoline transfers utilized the same piping in the area of TPA 24) and overfilling tanks during gasoline fueling operations. In 1997, Tanaq removed and scrapped the ASTs. In 2002 and 2003 approximately 1,731 cubic yards of PCS was removed from the TPA Sites 24 and 25-2 (Figure 1-3). In 2004, NOAA received concurrence from ADEC for conditional closure of TPA Site 24 (NOAA 2004b).

In 2001, NOAA installed monitoring well TPA24-MW-1; in 2002 monitoring wells TPA24-MW-2 and TPA24-MW-3 were installed down gradient of the TPA 24 excavation (Figures 1.3 and 2-1). Groundwater sampling was conducted in September/October 2001 (TPA24-MW-1), October 2002, August 2003, November 2003, January 2004 and May 2004. Sample analytical results indicated that all analytes (DRO, GRO, VOC, SVOC and metals) were below ADEC Table C criteria (Tetra Tech 2005a).

2.2.9 Non-TPA Related Wells

NOAA installed monitoring wells VIL-MW-2 in 2001 and STG-MW-1 in 2002 (Figure 2-1) for use in a hydrogeological modeling network. Groundwater sampling was conducted in September/October 2001 (VIL-MW-2), October 2002, August 2003, November 2003, January 2004 and May 2004. Sample

analytical results indicated that all analytes (DRO, GRO, VOC, SVOC and metals) were below ADEC Table C criteria (Tetra Tech 2005a).

2.2.10 St. George Monitoring Wells: Decommission

The following 22 monitoring wells will be decommissioned as they are no longer required due to (as discussed in preceding paragraphs) completion of soil remediation activities and uncontaminated groundwater: TPA6-MW-1, TPA6-MW-2, TPA7-MW-1, TPA7-MW-2, TPA7-MW-3, TPA7-MW-4, TPA7-MW-5, TPA9-MW-1, TPA9-MW-1A, TPA9-MW-2, TPA11-MW-1, TPA18-MW-1, TPA18-MW-2, TPA22.1-MW-1, TPA22.3-MW-1, TPA23-MW-1, TPA23-MW-2, TPA23-MW-3, TPA24-MW-1, TPA24-MW-2, TPA24-MW-3, VIL-MW-2, and STG-MW-1 (Figure 2-1). Well decommissioning will be accomplished in accordance with Section 4.0.

3.0 GROUNDWATER SAMPLING AND ANALYSIS

Groundwater sampling methodology, laboratory analyses, equipment decontamination procedures, and analytical data quality are described in the following sections.

3.1 GROUNDWATER SAMPLING METHODOLOGY

The retained monitoring wells will be sampled using a low-flow groundwater sampling technique in accordance with an approved standard operating procedure (SOP) for micropurging and sampling of groundwater.

Prior to sampling, the static water level in the well will be measured using an electronic water level indicator. The wells will then be purged using a GEOPUMP peristaltic pump (wells where water table is less than 30 feet bgs) or a Grundfos Rediflo2™ submersible pump (wells where the water table is deeper than 30 feet bgs) with dedicated low-density polyethylene tubing. In general, the wells will be purged at a low-flow rate (less than 500 milliliters per minute) while pH, temperature, conductivity, turbidity, dissolved oxygen, and oxidation-reduction potential will be monitored. After water quality parameters have stabilized in the well according to readings on a water quality meter, groundwater samples will be collected. During collection of groundwater samples for volatile organic compound (VOC) and gasoline range organics (GRO) analyses, the pumping rate will be reduced to less than 200 milliliters per minute to minimize the loss of VOCs. After samples have been collected, each sample container will be placed in a cooler with frozen gel packs to maintain the temperature at 4 °C +/- 2 °C.

3.2 LABORATORY ANALYSIS OF GROUNDWATER SAMPLES

Groundwater samples will be shipped overnight to an ADEC approved fix lab for analysis. Groundwater samples will be analyzed using the following analytical methods:

- GRO by ADEC Method AK101
- DRO by ADEC Method AK102
- Benzene and perchloroethylene by Environmental Protection Agency (EPA) Method 8260B
- Lead by EPA Method 6020

3.3 EQUIPMENT DECONTAMINATION

Before and after each deep monitoring well is sampled, the submersible pump will be decontaminated. The pump will be placed in a clean bucket that contains a solution of hot tap water and Alconox soap, and

a piece of new, dedicated tubing of sufficient length to redirect the flow from the pump back into the bucket will be attached to the pump. The pump will be turned on and allowed to recirculate in the bucket for a minimum of five minutes. The inside of the pump will then be rinsed using clean tap water in a bucket, allowing the pump to run for a minimum of three minutes.

3.4 ANALYTICAL DATA QUALITY

Analytical data quality will be evaluated per the procedures of NOAA's Master Quality Assurance Plan (NOAA 2003a).

3.5 WASTE MANAGEMENT

Waste generated as a result of monitoring well sampling will be managed in accordance with NOAA's Master Investigation-Derived Waste Plan (NOAA 2003b).

4.0 WELL DECOMMISSIONING

Well decommissioning shall be conducted in accordance with requirements specified in 18 Alaska Administrative Code (AAC) 75.345(j).

Well decommissioning activities will be documented on completed Well Abandonment Forms that will be forwarded to the ADEC, Division of Environmental Health, Drinking Water Program.

5.0 REFERENCES

ADEC 2003. *Title 18 of the Alaska Administrative Code 75, Articles 3 and 9. Oil and Hazardous Substances Pollution Control Regulations.* State of Alaska. Effective date January 30, 2003.

ADEC 2004a. Letter from Mr. Louis Howard (ADEC) to Mr. John Lindsay (NOAA) Re: Cottage C (TPA Site 11) St. George Island, January 20, 2004. Dated February 5, 2004.

ADEC 2004b. Letter from Mr. Louis Howard (ADEC) to Mr. John Lindsay (NOAA) Re: Draft Corrective Action Report Open Pits Two-Party Agreement Site 6, St. George, Alaska. Dated January 26, 2004.

ADEC 2004c. Letter from Mr. Louis Howard (ADEC) to Mr. John Lindsay (NOAA) Re: Request for No Further Action Planned Tanaq Shop Store Tank TPA Site 22-3/Site 24, St. George Island, Alaska. Dated October 8, 2004.

ADEC 2005. Letter from Mr. Louis Howard (ADEC) to Mr. John Lindsay (NOAA) Re: Draft Corrective Action Report TPA 9 Old Power Plant, St. George, Alaska, May 27, 2005. Dated June 15, 2004.

NOAA 1996. Pribilof Islands Environmental Restoration Two-Party Agreement, Attorney General's Office File No. 661-95-0126. National Oceanic and Atmospheric Administration. January 26.

NOAA 2003a. Master Quality Assurance Plan. Prepared for Work on Pribilof Islands, Alaska. National Oceanic and Atmospheric Administration's Pribilof Project Office. August.

NOAA 2003b. Master Investigation-Derived Waste Plan. Prepared for Work on Pribilof Islands, Alaska. National Oceanic and Atmospheric Administration's Pribilof Project Office. May.

NOAA 2004a. *Final Corrective Action Plan For Oceanfront Two Party Agreement Site 1(Former Diesel Tank Farm), Site 2 (Former Drum Storage Area), Site 3 (Inactive Gas Station), and Site 25-1 (Port Fuel Supply Line, East-West), St. George, Alaska.* U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Pribilof Project Office. February 18.

NOAA 2004b. Letter from Mr. John Lindsay (NOAA) to Mr. Louis Howard (ADEC) Subject: Request for Conditional Closure at Two-Party Agreement Site 24/Site 28, Inactive Gasoline Tank Farm, St. George Island, Alaska. Dated November 29, 2004; Concurred with by ADEC December 14, 2004.

NOAA 2005a. Draft Corrective Action Report, TPA Site 7/NOAA Site 7 – Ballfield/Former Landfill, Request for Conditional Closure, St. George Island, Alaska. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Pribilof Project Office. July 1.

NOAA 2005b. Letter from Mr. John Lindsay (NOAA) to Mr. Louis Howard (ADEC) Subject: Request for Conditional Closure Determination for St. George Island Two-Party Agreement (TPA) Site 18. Dated April 14, 2005; Concurred with by ADEC April 18, 2005.

NOAA 2005c. Letter from Mr. John Lindsay (NOAA) to Mr. Louis Howard (ADEC) Subject: Review and Approval of Conditional Closure Request, Abandoned Diesel Tank Farm, Site 27/Two-Party Agreement Site 23, St. George Island, Alaska. Dated February 22, 2005; Concurred with by ADEC February 28, 2005.

Polar 1997. *Environmental Site Investigation, St, George Debris Cleanup & UST Decommissioning, Pribilof Islands Environmental Restoration Project*. Polarconsult Alaska, Inc. November 2.

Polar 2004a. *Final Corrective Action Report, Open Pits Site, TPA Site 6, Remedial Corrective Action Project, St. George Island, Alaska*. Polarconsult Alaska, Inc. March 15.

Polar 2004b. *Final Corrective Action Report, Former Fuel Storage Area, TPA Site 18, Remedial Corrective Action Project, St. George Island, Alaska*. Polarconsult Alaska, Inc. July 26.

SLR 2005. *St. George Island Two Party Agreement (TPA) Sites 1 and 8 Product Removal Testing and Feasibility Study Repot*. SLR Alaska. June.

Tetra Tech 2004. *Draft LNAPL Evaluation and Remedial Approach, Two-Party Agreement Sites 1 and 8, Pribilof Environmental Restoration Project, St. George Island, Alaska.* Tetra Tech EM Inc. February 17.

Tetra Tech 2005a. *Final Field Investigation Report, Pribilof Islands Environmental Restoration Project, St. George Island, Alaska. Tetra Tech EM Inc.* June 23.

Tetra Tech 2005b. *Final Hydrogeological Characterization Study Report, Pribilof Islands Environmental Restoration Project, St. George Island, Alaska*. Tetra Tech EM Inc. June 12.

Tetra Tech 2005c. *Final Corrective Action Report, Site 9/TPA Site 9 – Old Power Plant, St. George Island, Alaska*. Tetra Tech EM Inc. July 6.

FIGURES

TABLES

TABLE 2-1
Long-Term Plans For St. George Monitoring Wells

St. George Monitoring Wells	Retain: Plume Sentinel	Retain: Free Product Removal	Decommission	Analytes	Monitoring Years/Freq.
TPA Site 1 (Former Diesel Tank Farm)					
TPA1-MW-1		X		TBD	TBD
TPA1-MW-2	X			GRO, DRO, Benzene, PCE	5/Semi-Annual
TPA1-MW-3	X			GRO, DRO, Benzene, PCE	5/Semi-Annual
TPA1-MW-4		X		TBD	TBD
TPA1-PER-1		X		TBD	TBD
TPA1-PER-2		X		TBD	TBD
TPA1-PER-3		X		TBD	TBD
TPA Site 2 (Former Drum Storage Area)					
TPA2-MW-1	X			GRO, DRO, Benzene, PCE	5/Semi-Annual
TPA2-MW-2	X			GRO, DRO, Benzene, PCE	5/Semi-Annual
TPA Site 6 (Open Pits Site)					
TPA6-MW-1			X	NA	NA
TPA6-MW-2			X	NA	NA
TPA Site 7 (Ballfield/Former Landfill)					
TPA7-MW-1			X	NA	NA
TPA7-MW-2			X	NA	NA
TPA7-MW-3			X	NA	NA
TPA7-MW-4			X	NA	NA
TPA7-MW-5			X	NA	NA
TPA Site 8 (Active Power Plant)					
TPA8-MW-1		X		TBD	TBD
TPA8-MW-2		X		TBD	TBD
TPA8-MW-3		X		TBD	TBD
TPA8-MW-4	X			GRO, DRO, Benzene, PCE	5/Semi-Annual
TPA8-MW-5		X		TBD	TBD
TPA8-MW-6		X		TBD	TBD
TPA8-MW-7		X		TBD	TBD
TPA8-MW-8		X		TBD	TBD
TPA8-MW-9	X			GRO, DRO, Benzene, PCE	5/Semi-Annual
TPA8-MW-10		X		TBD	TBD
TPA8-MW-11		X		TBD	TBD
TPA8-MW-12		X		TBD	TBD
TPA8-MW-13	X			GRO, DRO, Benzene, PCE	5/Semi-Annual
TPA Site 9 (Old Power Plant)					
TPA9-MW-1			X	NA	NA
TPA9-MW-1A			X	NA	NA
TPA9-MW-2			X	NA	NA
TPA Site 11 (Cottage C UST)					
TPA11-MW-1			X	NA	NA
TPA Site 18 (Former Fuel Storage Area)					
TPA18-MW-1			X	NA	NA
TPA18-MW-2			X	NA	NA
TPA Site 22-1 (School UST)					
TPA22.1-MW-1	X			GRO, DRO, Benzene, PCE	5/Semi-Annual
TPA Site 22-3 (Shop/Store UST)					
TPA22.3-MW-1			X	NA	NA
TPA Site 23 (Abandoned Diesel Tank Farm)					
TPA23-MW-1			X	NA	NA
TPA23-MW-2			X	NA	NA
TPA23-MW-3			X	NA	NA

TABLE 2-1 cont.					
St. George Monitoring Wells	Retain: Plume Sentinel	Retain: Free Product Removal	Decommission	Analytes	Monitoring Years/Freq.
TPA Site 24 (Inactive Gas Tank Farm)					
TPA24-MW-1			X	NA	NA
TPA24-MW-2			X	NA	NA
TPA24-MW-3			X	NA	NA
Village Monitoring Wells					
VIL-MW-1	X			GRO, DRO, Benzene, PCE	5/Semi-Annual
VIL-MW-2			X	NA	NA
VIL-MW-3	X			GRO, DRO, Benzene, PCE	5/Semi-Annual
STG-MW-1			X	NA	NA

GRO - Gasoline Range Organics
DRO – Diesel Range Organics
PCE - Perchloroethylene

TABLE 2-2
St. George Island Groundwater Analytical Results Synopsis

St. George Monitoring Wells	Free Product Observed?	DRO Above Table C?[1]	GRO Above Table C?	VOCs Above Table C?	SVOC above Table C?	Metals above Table C or Background?
TPA Site 1 (Former Diesel Tank Farm)						
TPA1-MW-1	**Yes**	NSF	NSF	NSF	NSF	NSF
TPA1-MW-2	No	**Yes**	No	No	No	No
TPA1-MW-3	No	**Yes**	**Yes**	**Yes**[2]	No	No
TPA1-MW-4	Yes	NSF	NSF	NSF	NSF	NSF
TPA1-PER-1	NSP	NSP	NSP	NSP	NSP	NSP
TPA1-PER-2	NSP	NSP	NSP	NSP	NSP	NSP
TPA1-PER-3	NSP	NSP	NSP	NSP	NSP	NSP
TPA Site 2 (Former Drum Storage Area)						
TPA2-MW-1	No	**Yes**	No	**Yes**[3]	No	No
TPA2-MW-2	No	No	No	No	No	No
TPA Site 6 (Open Pits Site)						
TPA6-MW-1	No	No	No	No	No	No
TPA6-MW-2	No	No	No	No	No	No
TPA Site 7 (Ballfield/Former Landfill)						
TPA7-MW-1	No	No	No	No	No	No
TPA7-MW-2	No	No	No	No	No	No
TPA7-MW-3	No	No	No	No	No	No
TPA7-MW-4	No	No	No	No	No	No
TPA7-MW-5	No	No	No	No	No	No
TPA Site 8 (Active Power Plant)						
TPA8-MW-1	**Yes**	NSF	NSF	NSF	NSF	NSF
TPA8-MW-2	No	**Yes**	No	**Yes**[4]	No	No
TPA8-MW-3	**Yes**	NSF	NSF	NSF	NSF	NSF
TPA8-MW-4	No	**Yes**	No	No	No	No
TPA8-MW-5	**Yes**	NSF	NSF	NSF	NSF	NSF
TPA8-MW-6	No	**Yes**	No	No	No	No
TPA8-MW-7	**Yes**	NSF	NSF	NSF	NSF	NSF
TPA8-MW-8	**Yes**	NSF	NSF	NSF	NSF	NSF
TPA8-MW-9	No	No	No	No	No	No
TPA8-MW-10	**Yes**	NSF	NSF	NSF	NSF	NSF
TPA8-MW-11	No	**Yes**	No	No	No	No
TPA8-MW-12	**Yes**	NSF	NSF	NSF	NSF	NSF
TPA8-MW-13	No	No	No	No	No	No
TPA Site 9 (Old Power Plant)						
TPA9-MW-1	No	No	No	No	No	No
TPA9-MW-1A	No	Yes[5]	NSP	NSP	NSP	NSP
TPA9-MW-2	No	No	No	No	No	No
TPA Site 11 (Cottage C UST)						
TPA11-MW-1	No	No	No	No	No	No
TPA Site 18 (Former Fuel Storage Area)						
TPA18-MW-1	No	No	No	No	No	No
TPA18-MW-2	No	No	No	No	No	No
TPA Site 22-1 (School UST)						
TPA-22.1-MW-1	No	No	No	No	No	No
TPA Site 22-3 (Shop/Store UST)						
TPA-22.3-MW-1	No	No	No	No	No	No

TABLE 2-2 (cont.)						
St. George Monitoring Wells	**Free Product Observed?**	**DRO Above Table C?**	**GRO Above Table C?**	**VOCs Above Table C?**	**SVOC above Table C?**	**Metals above Table C or Background?**
TPA Site 23 (Abandoned Diesel Tank Farm)						
TPA23-MW-1	No	No	No	No	No	No
TPA23-MW-2	No	No	No	No	No	No
TPA23-MW-3	No	No	No	No	No	No
TPA Site 24 (Inactive Gas Tank Farm)						
TPA24-MW-1	No	No	No	No	No	No
TPA24-MW-2	No	No	No	No	No	No
TPA24-MW-3	No	No	No	No	No	No
Village Monitoring Wells						
VIL-MW-1	No	No	No	No	No	No
VIL-MW-2	No	No	No	No	No	No
VIL-MW-3	No	No	No	No	No	No
STG-MW-1	No	No	No	No	No	No

DRO – Diesel Range Organics
GRO – Gasoline Range Organics
VOC – Volatile Organics
SVOC – Semi-Volatile Organis
NSF – Not sampled due to presence of free-phase petroleum product
NSP – Not sampled due to well screened in perched water zone not representative of main groundwater aquifer

Note 1: Table C refers to table found in Article 3 of Title 18 of the Alaska Administrative Code 75, *Oil and Hazardous Substances Pollution Control Regulations*.
Note 2: Benzene was the only VOC found above Table C requirements.
Note 3: Benzene was found above Table C requirements in single sampling event; November 2003.
Note 4: Perchloroethylene (PCE) was found above Table C requirements in single sampling event; May 2004.
Note 5: DRO was found above the ADEC Table C criterion in 2001 and 2002, however it was determined this well (TPA9-MW-1A) was installed in a perched water table that was not representative of the main groundwater aquifer. Therefore, the well was not sampled in 2003 and 2004.